IMPACT OF INTERVENTION PROGRAM ON THE IMPROVED URBAN HOUSEHOLD SOLID WASTE MANAGEMENT IN CHENNAI CITY, INDIA

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ABSTRACT

Solid waste management has become a serious issue in developing countries like India where urban household waste is mismanaged. This study aimed to determine the impact of an intervention program on the knowledge, attitudes and practices concerning solid waste management in Chennai city, India. 50 female homemakers from ward no.82 in Zone IX (Teynampet) were selected through purposive random sampling technique as samples to participate in the intervention program. An exclusively designed learning module was used to impart awareness for homemakers to increase their knowledge regarding solid waste issues and to encourage them to adopt better disposal practices at household level. A structured questionnaire was used to collect the details regarding the level of knowledge, attitude and waste handling practices of the selected women before and after the intervention program. The result showed a significantly increased level of knowledge about the issues of solid waste, a high significant change in the attitude towards the management of household solid waste and a significant difference in the household solid waste handling practices among the homemakers after the intervention program.

KEYWORDS: Homemakers, intervention program, solid waste management, urban household solid waste.

Introduction

Household solid waste comprises of garbage and rubbish such as bottles, cans, old clothing, old furnishings, food packaging, food scraps, newspapers and magazines and yard trimmings that originates from private homes or apartments. The rapid increase in the volume and composition of solid waste pose a threat to public health and environment in Indian countries (Harir, Kasim, & Ishiyaku, 2015). Solid waste is a complex mixture of solid materials as well as some liquid substances, only some of which are intrinsically detrimental to health (Nelson et al., 2009). The management of solid waste is one of the challenges facing any urban area in the World (Guerrero, Mass, & Hogland, 2013).

The World Bank's Waste report (2015) projects a 70% global increase in municipal solid waste by 2025, with developing countries facing the greatest challenges as their waste is expected to more than double. According to the Central Pollution Control Board (CPCB, 2015), the average waste generation in Indian cities is more than 500 tonne per day (Times of India, 2015).

Chennai, one of the metro cities in India, is generating the highest amount of municipal waste in the country (0.7 kg/capita/day) (Times of India, 2014). With large amount of solid waste generated every year, the total amount increasing with an increase in population. If this follows, then Chennai will be overwhelmed with solid waste and face a lack of area to take the waste. The solid waste generated in the city is comprised of 40 - 60% compostable, 30 - 50% inert waste and 10 - 30% recyclable waste. Despite of many initiatives taken by Greater Chennai Corporation towards the proper management of solid waste, the issue has become a massive threat. Therefore, there is an urgent need for the adoption of a safe waste disposal technique, which will be a holistic sustainable solution for the problems of solid waste management. The composition of solid waste in Chennai is found with a higher percent of organic matter which is generated mainly from kitchen. As homemakers are the main generators of kitchen waste, their contribution is considered as a key factor for the successful implementation of any solid waste alleviation programs. Hence, it is a need of the hour to create awareness and impart education for the homemakers to understand the waste related problems and concerns, appropriate technology behind solid waste management and its benefits.

Therefore, the study was conducted to assess the level of knowledge, attitude and practice of the selected homemakers towards solid waste management and to plan, conduct and evaluate the impact of an awareness program on knowledge, attitude and practice of solid waste management among the selected homemakers.

Methods and materials

The present study was conducted in Chennai city. Chennai city is the fourth largest metropolis in India. It is located between latitudes 13°04'N and longitudes 80°17'E. The city stretches along the east coast covering about 43 km of Bay of Bengal and extending about 19 km inland, encompassing an area of 426 sq km. Chennai city is governed by Greater Chennai Corporation which comes under Chennai Metropolitan Region. The city is classified into three regions: North Chennai, Central Chennai and South Chennai. It is further divided into 15 zones, consisting of 200 wards. There are 1.1 million households in the city. Within the limits of Greater Chennai Corporation, ward no.82 in Zone IX (Teynampet) was identified as the zone which generates maximum quantity of solid waste (Times of India, 2014) and thus formed the target population of the research.

Sampling Techniques

Purposive random sampling technique was used to select sample households for the study. The female homemakers from ward no.82 were contacted and handed over a consent form to find their willingness to participate in solid waste intervention program. 517 home makers showed great willingness to participate in the intervention program. From them, 10 percent of female homemakers (N=50) were selected as samples to participate in the intervention program.

Method of Data Collection

The primary data were collected using structured questionnaires from different household heads in Chennai city. Questionnaire was used to collect the details regarding the level of knowledge, attitude and the existing practices of the selected women towards solid waste management before and after the intervention program.

Planning and implementing the awareness program

Lack of knowledge on the safe disposal practices of residential waste have pushed the homemakers to show indifferent attitudes toward keeping immediate environment clean and lack of interest in taking part in the solid waste management programs. Based on this, a learning module was designed exclusively for homemakers to increase their environmental consciousness, to inform them of the impacts of their indiscriminate waste disposal practices and to broaden their understanding of the proper methods of disposal of dry and wet waste at household level. Before the intervention program, a pre-test was done to assess the knowledge, attitude and practices of the homemakers towards residential solid waste management using the questionnaire. The awareness on knowledge, attitude and practice of residential solid waste management was imparted to the selected homemakers based on the learning module developed through appropriate extension methods. The awareness program was conducted in six sessions, on the days convenient to the homemakers with the duration of two hours per day. Three month after completion of the pre-test and intervention program, homemakers were contacted back for the post-test. The gain in knowledge, change in attitude and improvement in household waste handling and disposal practices was assessed using the same questionnaire which was used for pre-test.

Analytical techniques

The data obtained was subjected to statistical interpretation using SPSS (Version 20.0). Descriptive statistics was used to examine the level of knowledge, attitude and waste disposal practices of selected homemakers of Chennai city. Paired t-test and Wilcoxon signed rank test were done to find out the significant differences with regard to the knowledge, attitude and waste management behavior of the selected women at the pre and post intervention program period.

Results and Discussion
The results of the study are discussed in detail under the following heads,

Gain in knowledge
Knowledge is important to predict waste management practices. Table 1 reveals the homemakers level of knowledge before and after the intervention program.

Table 1: Level of knowledge before and after the intervention program

Sl. No	Knowledge statement	Before		After	
		N=50	%	N=50	%
1.	Lack of environmental awareness is the main reason for improper disposal of household waste	43	86	44	88
2.	Proper solid waste management saves natural resources by reusing and recycling	25	50	43	86
3.	The major environmental risk factor associate with poor solid waste management is indoor and urban air pollution	27	54	50	100
4.	Segregation of waste reduces the amount of rubbish goes into waste bin	3	6	50	100
5.	Recycling of waste provides liveable environment for future	4	8	50	100
6.	Composting is a good way to recycle kitchen waste	12	24	50	100
7.	Organic vegetables contains more nutrients	25	50	50	100
8.	The use of kitchen waste compost to plants helps to reduce the application of chemicals, pesticides and insecticides	12	24	50	100
9.	Home composting ensures the protection of environment	4	8	50	100
10.	Flies and mosquitoes breeding are high in home composting	12	24	2	4

The increase in knowledge was obvious after intervention program in aspects such as association of poor solid waste management with air pollution, segregation of waste, recycling of waste, composting, organic vegetables, kitchen waste compost and home composting. There was remarkable difference in scores regarding breeding of flies and mosquitoes in home composting (24% and 4 %) between 'before' and 'after' awareness program clearly indicates the gain in knowledge. The gain in knowledge of home makers after intervention program was further analysed using paired sample test and the results are tabulated in the table 2

Table 2: Analysis of gain in knowledge

Variable	Intervention	N	Mean	Standard deviation	Standard error	't' - value	Level of significance
Knowledge	Before	50	3.34	1.12	0.158	43.11	P<0.001
	After	50	9.74	0.44	0.063		

The mean scores of knowledge before and after intervention were found to be 3.34 and 9.74 respectively. The knowledge score revealed that there was significant level of increase in the knowledge after the intervention program (P<0.001).

Change in attitude
The problems of improper solid waste management need to be tackled at the individual level, which requires individuals to develop positive attitudes which will increase their environmental consciousness and further guide them to adopt proper waste handling and disposal practices (Ahmed & Mohammed Al-Mekhlafi, 2009). Paired 't' test was performed to compare the change in attitude after intervention program. Table 3 presents the change in attitude of the homemakers.

Table 3: Analysis of change in attitude

Variable	Intervention	N	Mean	Standard deviation	Standard error	't' – value	Level of significance
Attitude	Before	50	19.96	4.5	0.64	27.25	P<0.001
	After	50	44.50	4.72	0.67		

The results showed a high significant difference in the attitude of homemakers regarding solid waste management before and after the intervention program at P<0.001 level.

Improvement in household waste management practices
Improvement in the practices of the homemakers with regard to the aspects of waste generation and handling before and after attending the intervention pro-gram were recorded.

Change in waste generation aspects
Figure 1 shows the impact of the awareness program on the change in behavior of homemakers towards household solid waste generation.
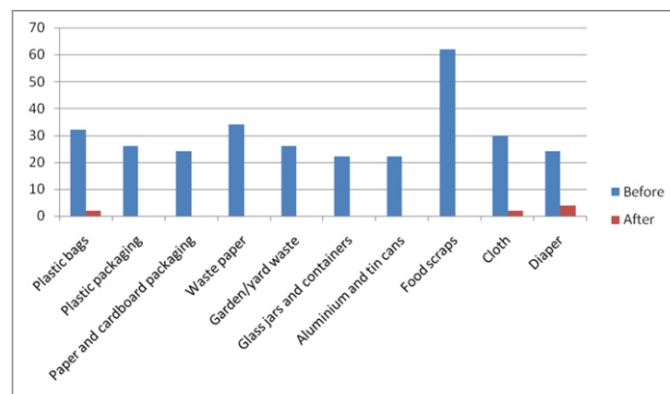

Figure 1: Changes in household solid waste generation aspects

Cent percent of the selected homemakers expressed that after attending the intervention program, the generation of various wastes such as plastic packaging, paper and cardboard packaging, waste paper, garden waste, glass jars and containers, aluminium and tin cans and food scraps was absolutely nil. The reason they cited was that they started recycling, reusing and composting the waste.

Changes in waste handling practice
The study result was further analysed using Wilcoxon Signed-Rank test to find the difference in waste handling practices of the selected homemakers before and after the intervention program.

Table 5 presents the results of Wilcoxon Ranks Table.

Table 5: Wilcoxon Ranks Table.

Post waste handling behaviour - pre waste handling behavior	N	Mean Rank	Sum of Ranks
Negative Ranks	0(a)	.00	.00
Positive Ranks	35(b)	18.00	630.00
Ties	15(c)		
Total	50		

The Wilcoxon Ranks Table provides the data on the comparison of home makers waste handling behaviour score before and after the intervention program. It is understood from the table's legend that none of the selected home makers had a higher pre-waste handling behaviour score than after their intervention program. However, 35 home makers had a higher waste handling behaviour score after intervention program and 15 home makers had no change in their waste handling behaviour score.

Table 6: Test statistics table

	Post waste handling behaviour - pre waste handling behavior
Z	-5.916(a)
Asymp. Sig. (2-tailed)	.000

The result from the test statistics table seemed to indicate that the post intervention program show an increased change in waste handling practices (average rank of 0 vs. average rank of 18.00). The Wilcoxon signed rank test shows that there is a statistically significant difference between the waste handling practices of home makers before and after the intervention program (Z=-5.916, p=0.000).

Conclusion
The study revealed that intervention program was very effective as a significantly increased level of knowledge, a high significant change in the attitude and a significant difference in the waste handling practices was found among the homemakers after the intervention program. The impact of the intervention program demanded the need for organising more community based initiatives by the local government to encourage the individual households to adopt an efficient waste management system.

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